

SPC 0403 PA

While certain representative embodiments and details have been shown for purposes of illustrating the invention, it will be apparent to those skilled in the art that various changes in the methods and apparatus disclosed herein may be made without departing from the scope of the invention, which is defined in the appended claims.

What is claimed is:

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1. A device for detecting the relative position of a generally horizontal reference plane of light, comprising:

a plurality of photodetector elements positioned on said device and arranged in a generally vertically oriented row, each of said plurality of photodetector elements providing an electrical output when illuminated with said plane of light,

a weighting circuit for providing a portion of the electrical output of each photodetector element as a first reference signal related to the spacing of the photodetector element from a first end of said row, and for providing a portion of the electrical output of each photodetector element as a second reference signal related to the spacing of the photodetector element from the second end of said row,

an output circuit, responsive to said weighting circuit, for determining the relative levels of said first and second reference signals such that the position of said reference plane of light with respect to said detector device is determined.

2. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 1, further comprising first additional photodetector elements electrically connected in parallel and positioned on said device above said generally vertically oriented row, and second additional photodetector elements electrically connected in parallel and positioned on said device below said generally vertically oriented row, such that an output from said first additional photodetector elements indicates that said plane of light is significantly above the middle of said generally vertically oriented row of photodetector elements and an output from said second additional photodetector elements indicates that said plane of light is significantly below the middle of said generally vertically oriented row of photodetector elements.

3. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 2, in which first additional photodetector elements extend in a generally vertical row, and in which said second additional photodetector elements extend in a generally vertical row.

4. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 1, in which said plurality of photodetector elements positioned on said device and arranged in a generally vertically oriented row includes an even total number of photodetector elements.

5. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 1, in which said photodetector elements comprise PIN diodes.

6. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 1, in which said weighting circuit comprises a tapped transformer with each of said plurality of photodetector elements being connected to said transformer.

7. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 6, in which said weighting circuit further comprises one or more resistors connecting said photodetector elements to said transformer.

8. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 1, in which said plurality of photodetector elements positioned adjacent each other on said device are evenly spaced along said generally vertically oriented row.

9. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 3, in which said first additional photodetector elements and said second additional photodetector elements are evenly spaced vertically.

10. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 9, in which the spacing between adjacent first additional photodetector elements and the spacing between adjacent second additional photodetector elements are both greater than the spacing between adjacent ones of said plurality of photodetector elements in said generally vertically oriented row.

11. The device for detecting the relative position of a generally horizontal reference plane of light according to claim 1, further comprising a display, responsive to said output circuit, for providing an indication of said position of said reference plane of light with respect to said detector device.

12. A method for detecting the relative position of a generally horizontal reference plane of light, comprising:

positioning a plurality of photodetector elements in a generally vertically oriented row, each of said plurality of photodetector elements providing an electrical output when illuminated with said plane of light,

providing a portion of the electrical output of each photodetector element as a first reference signal and providing a portion of the electrical output of each photodetector element as a second reference signal, the relative portions of the electrical output from each photodetector being related to the vertical position of the photodetector in the row, and

determining the position of said reference plane of light with respect to said row by determining the relative levels of said first and second reference signals.

13. The method for detecting the relative position of generally horizontal reference plane of light, according to claim 12, further comprising the step of displaying an indication of said position of said reference plane of light with respect to said row.

14. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 12 further comprising the steps of:

providing first additional photodetector elements, electrically connected in parallel and positioned above said generally vertically oriented row, and

providing second additional photodetector elements, electrically connected in parallel and positioned below said generally vertically oriented row, such that an output from said first additional photodetector elements indicates that said plane of light is significantly above the middle of said generally vertically oriented row of photodetector elements and an output from said second additional photodetector elements indicates that said plane of light is significantly below the middle of said generally vertically oriented row of photodetector elements.

15. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 14, further comprising the steps of:

positioning first additional photodetector elements extending in a generally vertical row, and

positioning second additional photodetector elements extending in a generally vertical row.

16. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 15, in which the step of positioning a plurality of photodetector elements in a generally vertically oriented row further comprises the step of providing an even total number of photodetector elements.

17. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 12, in which the step of positioning a plurality of photodetector elements in a generally vertically oriented row further comprises the step of positioning a plurality of PIN diodes in a generally vertically oriented row.

18. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 12, in which the step of providing a portion of the electrical output of each photodetector element as a first reference signal and providing a portion of the electrical output of each photodetector element as a second reference signal includes the step of separating said portions of said electrical outputs using a tapped transformer with each of said plurality of photodetector elements being connected to said transformer.

19. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 18, in which the step of separating said portions of said electrical outputs using a tapped transformer with each of said plurality of photodetector elements being connected to said transformer further includes the step of connecting said photodetector elements to said transformer using one or more resistors.

20. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 12, in which the step of positioning a plurality of photodetector elements in a generally vertically oriented row comprises the step of evenly spacing said plurality of photodetector elements along said generally vertically oriented row.

21. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 15 in which the steps of providing first additional photodetector elements extending in a generally vertical row, and providing second additional photodetector elements extending in a generally vertical row include the step of evenly spacing said first additional photodetector elements and said second additional photodetector elements vertically.

22. The method for detecting the relative position of a generally horizontal reference plane of light, according to claim 21 in which the step of evenly spacing said first additional photodetector elements and said second additional photodetector elements vertically includes the step of spacing adjacent first additional photodetector elements and spacing adjacent second additional photodetector elements further apart than the spacing between adjacent ones of said plurality of photodetector elements in said generally vertically oriented row.